UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/807,333	03/24/2004	Tetsuo Okuyama	250997US2SRD	4007

22850 7590 08/05/2008
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER	
TURNER, KATHERINE ANN	

ART UNIT	PAPER NUMBER
1795	

NOTIFICATION DATE	DELIVERY MODE
08/05/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

Office Action Summary	Application No.	Applicant(s)	
	10/807,333	OKUYAMA ET AL.	
	Examiner	Art Unit	
	Katherine Turner	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 27 May 2008.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-4,6-13 and 15-21 is/are pending in the application.

4a) Of the above claim(s) 5 and 14 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-4,6-13 and 15-21 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 24 March 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

FINAL ACTION

Response to Amendment

1. The amendment filed May 27, 2008 has been entered. Claims 1-4, 6-13, and 15-21 are pending. Claims 5 and 14 have been cancelled by Applicant.

2. The previous objection to the specification is withdrawn in light of Applicant's amendment to the paragraph beginning at page 15, line 13.

Claim Objections

3. Claim 13 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 13 recites the limitation of "the negative electrode contains at least one negative electrode active material selected from the group consisting of a carbonaceous material capable of deintercalating an alkaline metal ion or alkaline earth metal ion, a metal compound capable of deintercalating an alkaline metal ion or alkaline earth metal ion, an alkaline meal, and an alkaline earth metal," but it depends from claim 1 which recites the limitation of "a negative electrode active material which intercalates and deintercalates lithium ions."

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the Applicant regards as his invention.

5. Claim 21 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Claim 21 recites the limitation "hydrophobic thermoplastic resins" and depends upon claim 1. Claim 1 does not recite the limitation "hydrophobic thermoplastic resins," but only thermoplastic resins. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 1-3, 6, 10-12, 13-15, and 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaplan et al. (US 6,270,921) in view of Okazaki et al. (JP 401059782A), Porter et al. (US 3,840,404), Espig et al. (GB 1256419), Abraham et al. (J. Electrochem. Soc., Vol. 143, No. 1, January 1996; cited in Information Disclosure

Statement), and Norio et al. (JP10-083836; refer to IPDL JPO machine translation), and as evidenced by Tekeuchi et al. (US 2003/0047809), Golovin et al. (US 5,733,677), Hatakeyama et al. (US 6,063,503), and Hoyt et al. (US 5,445,884).

As to claims 1, 13, 15, and 21, Kaplan teaches an air battery (10) comprising:

- a cathode can (50 and 320) (Applicant's container) having a surface in which openings (100) (Applicant's air pores) are formed (figures 1 and 6; column 2, lines 61-63; column 3, lines 3-4; column 4, lines 41-46; column 6, lines 55-61);
- an electrode group provided in the battery container and including a cathode (80 and 400) (Applicant's air positive electrode) (figures 1 and 6; column 1, line 29; column 2, line 65; column 7, line 5),
- an anode (40 and 420) (Applicant's negative electrode) (figures 1 and 6; column 1, line 28; column 3, line 13; column 7, lines 6-7),
- and a separator (90 and 410) provided between the cathode and the anode (figures 1 and 6; column 2, line 65; column 6, lines 19-32; column 7, line 6);
- a membrane (70 and 390) (Applicant's barrier film) which is provided between the surface of the cathode can (50 and 320) (Applicant's battery container) and the cathode (80 and 400) (Applicant's positive electrode) of the electrode group, the membrane (70 and 390) (Applicant's barrier film) being formed of polytetrafluoroethylene, a fluorine resin, (Applicant's thermoplastic resin) and having a thickness of 100 μm (figures 1 and 6; column 5, lines 11-17),
- and an air diffusion layer (60 and 380) (Applicant's gap holding member)

- the membrane (70 and 390) (Applicant's barrier film) can be laminated onto the cathode can (50 and 320) (Applicant's container) (column 5, lines 14-15), and the cathode can (50 and 320) has the air diffusion layer (60 and 380) sealed onto it (column 4, lines 63-67), therefore the membrane (70 and 390) can be laminated onto the air diffusion layer (60 and 380) and together they comprise a laminate sheet (figures 1 and 6)
- and the membrane (70 and 390) (Applicant's barrier film) is opposite to the cathode (80 and 400) (Applicant's positive electrode) (figures 1 and 6; column 4, lines 62-65; column 5, lines 4-16),
- and the air diffusion layer (60 and 380) (Applicant's gap holding member) comprising a porous film (figures 1 and 6; column 5, lines 4-11),
- wherein the openings (100 and 370) (Applicant's air pores) of the cathode can (50 and 320) (Applicant's battery container) are sealed by the air diffusion layer (60 and 380) (Applicant's gap holding member) and membrane (70 and 390) (Applicant's barrier film) laminated together (figures 1 and 6; column 4, lines 62-65; column 5 lines 13-15).

Takeuchi evidences that polytetrafluoroethylene is a thermoplastic resin ([0027], lines 21-22).

Golovin evidences that polytetrafluoroethylene is hydrophobic (column 4, lines 23-24).

Kaplan discloses a membrane (70 and 390) (Applicant's barrier film), but does not disclose the oxygen permeation coefficient of the membrane.

Okazaki teaches an air battery utilizing a thin film (11) (Applicant's barrier film) polymethylpentene (Abstract), which is 0.3 µm (Table 1). Hatakeyama provides evidence that polymethylpentene is a thermoplastic polyolefinic resin (column 7, lines 20-29). Hoyt evidences that polymethylpentene is a hydrophobic polyolefin (column 2, lines 17-25). Applicant discloses that polymethylpentene film at 10 µm has the oxygen permeation coefficient of 4.9×10^{-15} mol•m/m^2•sec•Pa (page 39, table 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute Kaplan et al.'s membrane for Okazaki et al.'s polymethylpentene film, because it has selective permeability of oxygen, as taught by Okazaki (abstract). Furthermore, the courts have held that the selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

Kaplan modified by Okazaki does not teach the specific oxygen permeation coefficient being 1×10^{-14} mol•m/m^2•sec•Pa or less.

Porter teaches a metal/oxygen cell with an anode as described in Espig (column 2, lines 15-19). Espig descibes the anode as zinc (column 3, lines 9-10). Porter teaches an inner layer (14b) which allows oxygen or air to permeate therethrough, but will prevent moisture or electrolyte from passing therethrough (Applicant's barrier film) (figure 1; column 2, lines 35-38) made of polytetrafluoroethylene (PTFE) (column 3, lines 47-48). Porter teaches that the current of the cell may be limited by limiting the

diffusivity (Applicant's oxygen permeation) of the layer (14b) by varying the thickness of the layer (column 2, lines 39-42).

Porter teaches that the thickness of a barrier film that allows for oxygen permeation (Applicant's barrier film) is a results effective variable. Therefore, the determination of the optimum thickness, in regards to the oxygen permeation) of the polymethylpentene film (Applicant's barrier film) would only require routine experimentation.

A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977). See MPEP 2144.05.It would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the thickness of the polymethylpentene film (Applicant's barrier film) of Kaplan as modified by Okazaki to provide the correct oxygen permeation coefficient (Applicant's 1×10^{-14} mol•m/m^2•sec•Pa or less), because varying the thickness of a layer (14b) (Applicant's barrier film) will limit the current of the cell by limiting the diffusivity (Applicant's oxygen permeation) of a layer (14b) (Applicant's barrier film), as taught by Porter (column 2, lines 39-42). Furthermore, the courts have held that optimization of a results effective variable is not novel. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Kaplan modified by Okazaki, Porter et al., and Espig et al., teaches an anode (40 and 420) (Applicant's negative electrode) (figures 1 and 6; column 1, line 28; column 3,

lines 12-13; column 7, lines 6-7) of zinc, a cathode (80 and 400) (Applicant's positive electrode) of manganese dioxide (MnO_2), and an aqueous electrolyte (column 3, lines 45-46), but is silent to it containing a negative electrode active material which intercalates and deintercalates lithium ions and a non-aqueous electrolyte.

Abraham teaches an air lithium secondary battery with a lithium foil, a carbon composite cathode, and a non-aqueous electrolyte (column 2, lines 35-39). Abraham teaches that lithium oxygen cells have very high energy density and higher calculated open-circuit voltage than zinc oxygen cells (Table I; column 3, lines 29-32).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute Kaplan's zinc oxygen cell electrodes and electrolyte combination with Abraham's lithium oxygen cell electrodes and electrolyte combination, because lithium oxygen cells have very high energy density and higher calculated open-circuit voltage than zinc oxygen cells, as taught by Abraham (Table I; column 3, lines 29-32).

Kaplan as modified by Okazaki, Porter et al., Espig et al., and Abraham et al. do not teach that the negative electrode active material intercalates and deintercalates lithium ions.

Norio teaches an air lithium battery that contains a negative electrode (2) active material which carries out occlusion discharge of the lithium ion (Applicant's intercalates and deintercalates lithium ions ([0008]), and an anode (1) (Applicant's positive electrode) ([0015]) that contains carbonaceous material ([0009]), and a nonaqueous solid electrolyte (3) (drawing 1; [0011]; [0012]; [0013]; [0014]). Norio teaches that

utilizing this electrodes and electrolyte provide improved cycle life ([0014]; [0033]; [0034]). Norio teaches that carbonaceous anodes that intercalate and deintercalate lithium ions in a lithium air cell are an improvement over lithium metal anodes in a lithium air cell since the carbonaceous anodes provide improved cell capacity and charge-and-discharge cycle life ([0004]; [0005]; [0006]; [0007]).

It would have been obvious to one of ordinary skill in the art to substitute the lithium anode of Kaplan as modified by Okazaki, Porter et al., Espig et al., and Abraham et al. with the carbonaceous anode of Norio because the carbonaceous anode provides an improved cell capacity and charge-and-discharge cycle life of a lithium air battery ([0004]; [0005]; [0006]; [0007]).

Regarding claim 2, Kaplan modified by Okazaki, Porter et al., Espig et al., Abraham et al. and Norio is silent as to the internal pressure in the air battery container during continuous discharge. The Applicant's disclosure states that the internal pressure can be kept lower than atmospheric pressure by 0.1 to 80 kPa during continuous discharge if the barrier film has an oxygen permeation coefficient of $1x10^{-14}$ $mol•m/m^2•sec•Pa$ or less (page 8, lines 21-27; page 9, line 1), and the ratio of the gap in the battery container, except for the portion of the laminated sheet, is in the range of 5 to 40% (page 9, lines 12-15).

The ratio of the gap in the air battery container, the area between the cathode and anode cans (20, 50, 310, and 320), of Kaplan is within the range of 5 to 40% (figures 1 and 6). The cathode can (50 and 320) has a height of 4 mm and a thickness

of 0.25 to 0.5 mm (column 4, lines 41-49), the anode can (20 and 310) has a thickness of 0.2 to 0.5 mm (column 3, lines 3-4), the air diffusion layer (60 and 380) has a thickness of 0.1 to 0.2 mm (column 5, lines 7-11), and the membrane (70 and 390) has a thickness of 0.1mm (column 5, lines 12-15). Working with these numbers, the space inside the battery container is the thicknesses of the containers top and bottom faces (0.25 to 0.5mm and 0.2 to 0.5 mm) subtracted from the height of the container (4 mm), which equals 3 to 3.55 mm. The thickness of the gap is the thickness of the air diffusion layer (0.1 to 0.2 mm) added to thickness of the membrane (0.1 mm), which equals 0.2 to 0.3 mm. The ratio of the gap (0.2 to 0.3 mm) in the battery container (3 to 3.55 mm) is 5.6 to 10%, which falls within the range of 5 to 40%.

Therefore, Kaplan as modified by Okazaki, Porter et al., Espig et al., Abraham et al. and Norio necessarily possesses the internal pressure in the battery container kept lower than atmospheric pressure by 0.1 to 80 kPa during continuous discharge.

Regarding claim 3, Kaplan teaches an air battery wherein the ratio of the gap in the battery container except the portion of the laminated sheet is 5.6 to 10%, which falls into the range of 5 to 40% (figures 1 and 6; column 3, lines 3-4; column 4, lines 41-49; column 5, lines 7-15). The Applicant is directed above for complete discussion of the ratio of the gap calculations.

Regarding claim 6, Kaplan teaches an air diffusion layer (60 and 380) (Applicant's gap holding member) of 100 to 200 μm, which falls within the range of 10 to 500 μm (figures 1 and 6; column 5, lines 7-8).

Regarding claims 10, 11, and 20, Kaplan discloses an air diffusion layer (60 and 380) (Applicant's gap holding member) which is sealed to the cathode can (column 4, lines 63-67), with a membrane (70 and 390) (Applicant's barrier film) which is then laminated onto the cathode can (50 and 320) (column 5, lines 14-15) upon the already sealed air diffusion layer (60 and 380) (figures 1 and 6; column 4, lines 63-67), but is silent as to the laminated air diffusion layer and membrane further comprising a second gap holding member (Applicant's claim 10 and 20), comprising at least one selected from the group of a porous film, a nonwoven fabric, and a woven fabric (Applicant's claim 11). Okazaki teaches a second porous body (4) (Applicant's second gap holding member) which is layered in between the nonporous polymethylpentene film (Applicant's barrier film) and the battery container with air intake holes (3) (Applicant's air pores) (figures 1-2; Abstract). The polymethylpentene film is layered between the second porous body (4) and the porous film (2) which is the nearest layer to the cathode (figures 1-2; Abstract). Okazaki further teaches that the second porous body (Applicant's second gap holding member) is made of a porous film (Abstract). It would have been obvious to one of ordinary skill in the art at the time of the invention to add a second gap holding member to the laminated layers of Kaplan modified by Okazaki, Porter et al., Espig et al., Abraham et al. and Norio for the benefit of optimizing oxygen diffusion, as taught by Okazaki (Abstract).

Regarding claim 12, Kaplan teaches a cathode (80 and 400) (Applicant's air positive electrode) containing carbon (figures 1, 2 and 6; column 5, lines 31-32).

9. Claims 4 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaplan in view of Okazaki, Porter, Espig, Abraham, and Norio, and evidenced by Tekeuchi, Hatakeyama, Golovin, and Hoyt as applied to claims 1 and 15 above, and further in view of Arao et al. (WO 2063703 A1; relying upon an English equivalent US 7,205,042 B2 for citation), and as evidenced by Rosato et al. (Injection molding Handbook; 3rd Edition; Rosato, Dominick V.; Rosato, Donald V.; Rosato, M.G.; 2000; Springer - Verlag).

Kaplan in view of Okazaki, Porter, Espig, Abraham, and Norio, and evidenced by Tekeuchi, Hatakeyama, Golovin, and Hoyt teach all the limitations of claims 1 and 15, and are incorporated herein. Regarding claims 4 and 19, Kaplan as modified by Okazaki, Porter et al., Espig et al., Abraham et al. and Norio is silent as to the battery container being formed of a laminate film containing aluminum and satisfying the (Y x T) < 10^2 formula. It is known in the battery art to utilize a laminate film containing aluminum and satisfying the (Y x T) < 10^2 formula for battery containers, as taught by Arao. Arao teaches the aluminum foil can be as thick as 100 μm (column 3, line 30), and the polypropylene resin can be as thick as 100 μm (column 7, lines 43-45; column 7, lines 50-54; column 8, lines 32-35). It is known that aluminum has a Young's modulus of 76 x 10^3 MPa, as taught by Rosato (page 1325, Table 17-1) with a thickness of 100 x 10^{-6} m which would lead to Y x T = 7.6. It is known that polypropylene has a Young's modulus of 50 x 10^3 MPa, as taught by Rosato (page 1325, Table 17-1) with a thickness of 100 x 10^{-6} m which would lead to Y x T = 5. Therefore each film separately and as a laminate satisfies the formula. It would have been obvious to one of ordinary

skill in the art at the time of the invention to substitute Arao et al.'s aluminum resin material for Kaplan et al.'s steel nickel material (column 4, lines 41-43) because aluminum resin and steel nickel are art recognized equivalents as a battery container material. See MPEP 2144.06. Furthermore, the aluminum resin material is a light weight material, and it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a light weight material in order to lower the weight of the overall battery.

10. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kaplan in view of Okazaki, Porter, Espig, Abraham, and Norio, and evidenced by Tekeuchi, Hatakeyama, Golovin, and Hoyt as applied to claim 1 above, and further in view of Kelsey et al. (US 2002/0132161 A1).

Kaplan in view of Okazaki, Porter, Espig, Abraham, and Norio, and evidenced by Tekeuchi, Hatakeyama, Golovin, and Hoyt teach all the limitations of claim 1 and is incorporated herein. Regarding claim 7, Kaplan modified by Okazaki, Porter et al., Espig et al., Abraham et al. and Norio teaches a porous film (Applicant's gap holding member), but is silent as to the range of porosity of the porous film. Kelsey teaches that barrier layers (Applicant's gap holding member) area modified or altered to affect, e.g., increase or decrease, the mass transport resistance of the battery cells (paragraph [0056], lines 1-3). Kelsey further teaches that the degree of modification can vary and can be controlled, for example, by controlling the amount of work applied. In embodiments, relative to an area that is not altered, the altered areas can have a lower porosity, e.g., 90%, 80%, 70%, 60%, 50%, 40%, 30%, 20%, or 10% of the porosity of

the unaltered area. The unaltered and altered areas can have similar differences in terms of mass transport resistance and/or density. Thus, Kelsey teaches that barrier layers' (Applicant's gap holding member) porosity is a result effective variable. It would have been obvious to one of ordinary skill in the art at the time of the invention to vary the porosity of the film for the benefit of adjusting the mass transport properties of the film, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). MPEP 2144005 IIB

11. Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaplan in view of Okazaki, Porter, Espig, Abraham, and Norio, and evidenced by Tekeuchi, Hatakeyama, Golovin, and Hoyt as applied to claim 1 above, and further in view of Yoshino et al. (JP02060052A).

Kaplan in view of Okazaki, Porter, Espig, Abraham, and Norio, and evidenced by Tekeuchi, Hatakeyama, Golovin, and Hoyt teach all the limitations of claim 1 and is incorporated herein. Regarding claims 8 and 9, Kaplan modified by Okazaki, Porter et al., Espig et al., Abraham et al. and Norio teaches a porous film (Applicant's gap holding member), but is silent as to the air permeability of the porous film being 1000 sec/100cm^3 or less (Applicant's claim 8), and the type of material that the porous film is made of (Applicant's claim 9). Yoshino teaches polypropylene and polyethylene as the porous film (Applicant's gap holding member) (Abstract). It would have been obvious to one of ordinary skill in the art at the time of the invention to substitute Kaplan et al.'s porous film for Yoshino et al.'s polypropylene and polyethylene film, which are both

polyolefin film; because they are art recognized equivalents as porous film materials (See MPEP 2144.06). Applicant discloses that polypropylene film has the air permeability of 4.5 sec/100 cm^3 (page 39, table 1), and that polyethylene film has the air permeability of 450 sec/100 cm^3 (page 39, table 1). Thus, the porous film of Kaplan modified by Yoshino necessarily has air permeability of the porous film being 1000 sec/100cm^3 or less.

It has been held by the courts that if the prior art teaches the identical chemical structure, the properties Applicant discloses and/or claims are necessarily present. In re Spada, 911 F2d. 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). See MPEP 2112.01.

12. Claims 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaplan in view of Okazaki, Porter, Espig, Abraham, and Norio, and evidenced by Tekeuchi, Hatakeyama, Golovin, and Hoyt as applied to claims 1 and 15 above, and further in view of Tinker (US 5,506,067).

Kaplan in view of Okazaki, Porter, Espig, Abraham, and Norio, and evidenced by Tekeuchi, Hatakeyama, Golovin, and Hoyt teach all the limitations of claims 1 and 15 and is incorporated herein.

Regarding claim 16, the references are silent as to the electrode group contained in a bag formed of the laminated sheet. It is known in the battery art to contain the cathode and anode (20 and 14) (Applicant's electrode group) in a bag formed of the gas-permeable, liquid-impermeable membrane (106) (Applicant's laminated sheet), as taught by Tinker (figure 3; column 9, lines 3-7). It would have been obvious to one of

ordinary skill in the battery art at the time of the invention to contain the electrode group of Kaplan et al. in a bag formed of the laminated sheet, because it provides a liquid-impermeable layer to retain electrolyte within the cell case as taught by Tinker (column 9, lines 5-7).

Regarding claim 17, Kaplan modified by Okazaki, Porter et al., Espig et al., Abraham et al. and Norio is silent as to the internal pressure in the air battery container during continuous discharge. The Applicant's disclosure states that the internal pressure can be kept lower than atmospheric pressure by 0.1 to 80 kPa during continuous discharge if the barrier film has an oxygen permeation coefficient of $1x10^{-14}$ mol•m/m^2•sec•Pa or less (page 8, lines 21-27; page 9, line 1), and the ratio of the gap in the battery container, except for the portion of the laminated sheet, is in the range of 5 to 40% (page 9, lines 12-15).

The ratio of the gap in the air battery container, the area between the cathode and anode cans (20, 50, 310, and 320), of Kaplan et al. is within the range of 5 to 40% (figures 1 and 6). The cathode can (50 and 320) has a height of 4 mm and a thickness of 0.25 to 0.5 mm (column 4, lines 41-49), the anode can (20 and 310) has a thickness of 0.2 to 0.5 mm (column 3, lines 3-4), the air diffusion layer (60 and 380) has a thickness of 0.1 to 0.2 mm (column 5, lines 7-11), and the membrane (70 and 390) has a thickness of 0.1mm (column 5, lines 12-15). Working with these numbers, the space inside the battery container is the thicknesses of the containers top and bottom faces (0.25 to 0.5mm and 0.2 to 0.5 mm) subtracted from the height of the container (4 mm), which equals 3 to 3.55 mm. The thickness of the gap is the thickness of the air diffusion

layer (0.1 to 0.2 mm) added to thickness of the membrane (0.1 mm), which equals 0.2 to 0.3 mm. The ratio of the gap (0.2 to 0.3 mm) in the battery container (3 to 3.55 mm) is 5.6 to 10%, which falls within the range of 5 to 40%.

Therefore, Kaplan modified by Okazaki, Porter et al., Espig et al., Abraham et al. and Norio necessarily possesses the internal pressure in the battery container kept lower than atmospheric pressure by 0.1 to 80 kPa during continuous discharge.

Regarding claim 18, Kaplan modified by Okazaki, Porter et al., Espig et al., Abraham et al. and Norio. teaches all the limitations of claims 1, 15, 16, and 17 and is incorporated herein. Kaplan modified by Okazaki, Porter et al., Espig et al., Abraham et al. and Norio teaches an air battery wherein the ratio of the gap in the battery container except the portion of the laminated sheet is 5.6 to 10%, which falls into the range of 5 to 40% (figures 1 and 6; column 3, lines 3-4; column 4, lines 41-49; column 5, lines 7-15). The Applicant is directed above for complete discussion of the ratio of the gap calculations.

Response to Arguments

13. Applicant's arguments filed 5/27/2008 have been fully considered but they are not persuasive.

On page 10, Applicant argues that Kaplan does not describe or suggest the barrier film being formed of thermoplastic resins and having a thickness of 2 to 100 μm. Kaplan teaches the membrane (70 and 390) (Applicant's barrier film) being formed of polytetrafluoroethylene, a fluorine resin, (Applicant's thermoplastic resin) and having a

thickness of 100 μm (figures 1 and 6; column 5, lines 11-17). Takeuchi evidences that polytetrafluoroethylene is a thermoplastic resin ([0027], lines 21-22).

On page 10, Applicant argues that Kaplan does not describe or suggest a negative electrode containing a negative electrode active material which intercalates and deintercalates lithium ions. Kaplan modified by Okazaki, Porter et al., Espig et al., Abraham et al. and Norio teaches an improvement on the zinc oxygen cell of Kaplan with a lithium oxygen cell having a negative electrode active material which intercalates and deintercalates lithium ions. Please see the combination above in the rejection under § 103, above.

On page 11, Applicant argues that Kaplan does not describe or suggest a nonaqueous electrolyte. Kaplan in view of Norio teaches a nonaqueous electrolyte. Please see the combination above in the rejection under § 103, above.

On page 11, Applicant argues that Okazaki does not describe or suggest the barrier film being formed of thermoplastic resins and having a thickness of 2 to 100 μm. Okazaki teaches an air battery utilizing a thin film (11) (Applicant's barrier film) polymethylpentene (Abstract), which is 0.3 μm (Table 1). Hatakeyama evidence that polymethylpentene is a thermoplastic polyolefinic resin (column 7, lines 20-29). Hoyt evidences that polymethylpentene is a hydrophobic polyolefin (column 2, lines 17-25). Porter teaches that the thickness of Kaplan in view of Okazaki's polymethylpentene film (Applicant's barrier film) is a result effective variable layer (column 2, lines 39-42). Please see the combination above in the rejection under § 103, above.

On page 12, Applicant argues that Okazaki does not describe or suggest a negative electrode containing a negative electrode active material which intercalates and deintercalates lithium ions. Kaplan in view of Norio teaches a negative electrode active material which intercalates and deintercalates lithium ions. Please see the combination above in the rejection under § 103, above.

On page 12, Applicant argues that Okazaki does not describe or suggest a nonaqueous electrolyte. Kaplan in view of Norio teaches a nonaqueous electrolyte. Please see the combination above in the rejection under § 103, above.

On page 13, Applicant argues that Yoshino does not describe or suggest the barrier film being formed of thermoplastic resins and having a thickness of 2 to 100 μm. Kaplan teaches the membrane (70 and 390) (Applicant's barrier film) being formed of polytetrafluoroethylene, a fluorine resin, (Applicant's thermoplastic resin) and having a thickness of 100 μm (figures 1 and 6; column 5, lines 11-17). Takeuchi evidences that polytetrafluoroethylene is a thermoplastic resin ([0027], lines 21-22).

On page 13, Applicant argues that Yoshino does not describe or suggest a negative electrode containing a negative electrode active material which intercalates and deintercalates lithium ions. Kaplan in view of Norio teaches a negative electrode active material which intercalates and deintercalates lithium ions. Please see the combination above in the rejection under § 103, above.

On page 13, Applicant argues that Yoshino does not describe or suggest a nonaqueous electrolyte. Kaplan in view of Norio teaches a nonaqueous electrolyte. Please see the combination above in the rejection under § 103, above.

Conclusion

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Correspondence/Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katherine Turner whose telephone number is (571)270-5314. The examiner can normally be reached on Monday through Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Susy Tsang-Foster can be reached on (571)272-1293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. T./
Examiner, Art Unit 1795

/Susy Tsang-Foster/
Supervisory Patent Examiner, Art Unit 1795